

SECURITY

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REF: TELECON [REDACTED] 30 SEPTEMBER 1970

1. FOLLOWING IS A PROCEDURE TO CONVERT YAW VALUES IN A GEOCENTRIC INERTIAL SYSTEM (AS REPORTED IN THE [REDACTED] DATA) TO YAW VALUES IN A LOCAL VERTICAL SYSTEM RELATIVE TO THE GROUND TRACK VELOCITY VECTOR AS DISCUSSED IN REF.

2. THE MATHEMATICAL TECHNIQUES FOR THIS TRANSFORMATION CONSIST OF AN ORTHOGONAL ROTATION OF THE GEOCENTRIC INERTIAL SYSTEM INTO THE LOCAL VERTICAL SYSTEM. THE ANGLE OF ROTATION IS COMPUTED AS FOLLOWS:

LET: V EQUAL INERTIAL VELOCITY (FPS)

GAMMA EQUAL FLIGHT PATH ANGLE

AZ EQUAL INERTIAL AZIMUTH

THETA EQUAL NADIR LATITUDE

H EQUAL ALTITUDE (FEET)

R EQUAL RADIUS OF EARTH (20,855,000 FT.)

OMEGA EQUAL 0.7292115E-05 (EARTH'S ROTATION RATE IN RADIANS/SEC) (NOTE EXPONENTIAL NOTATION)

THEN: VP EQUALS $V \cos(\text{GAMMA}) R / CR$ PLUS HVGX EQUALS $VP \sin(AZ) - R \text{ OMEGA } \cos(\text{THETA})$ VGY EQUALS $VP \cos(AZ)$

FINALLY:

A EQUALS $\text{ARCTAN}(VGX/VGY) - AZ$ (WHERE THE ARCTAN FUNCTION YIELDS VALUES FROM 0 TO 2 PI)

3. AFTER DETERMINING ANGLE A, THE APPLICATION OF THIS ORTHOGONAL ROTATION RESULTS IN A CHANGE TO YAW ONLY. PITCH AND ROLL ARE NOT AFFECTED. THUS, YAW EQUALS GEOCENTRIC YAW PLUS A.

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